

IN THE CLAIMS

1. (Currently amended) Apparatus (40; 60; 80; 90) for processing an input signal ($S_{\text{sub-RF}}(t)$) having a carrier frequency ($\omega_{\text{sub-RF}}$) that defines a desired band and at least a side band having a side band frequency ($n\omega_{\text{sub-LO}}$) that is higher than the carrier frequency ($\omega_{\text{sub-RF}}$), the apparatus (40; 60; 80; 90) comprising a main input (50; 70; 79; 92) for receiving said input signal ($S_{\text{sub-RF}}(t)$), a first mixer (41; 61) having a first mixer input (44; 64), a first local oscillator input (47; 67), and a first mixer output (A), the first mixer input (44; 64) being connectable to the main input (50; 70; 79; 92) and the first local oscillator input (47; 67) being connectable to a source (86; 87; 93) providing a first local oscillator signal (LO1) having a frequency ($\omega_{\text{sub-LO}}$) close to or equal to the carrier frequency ($\omega_{\text{sub-RF}}$), the first mixer (41; 61) performing a multiplication of said input signal ($S_{\text{sub-RF}}(t)$) and said first local oscillator signal (LO1) to provide a first output signal ($S_{\text{sub-A}}(t)$) at the first mixer output (A), the apparatus (40; 60; 80; 90) being characterized in that it further comprises at least a second mixer (42; 62) having a second mixer input (45; 65), a second local oscillator input (48; 68), and a second mixer output (B), the second mixer input (45; 65) being connectable to the main input (50; 70; 79; 92) and the second local oscillator input (48; 68) being connectable to a source (86; 87; 94) providing a second local oscillator signal (LO2) having the sideband frequency ($n\omega_{\text{sub-LO}}$), the second mixer (42; 62) performing a multiplication of said input signal ($S_{\text{sub-RF}}(t)$) and said second local oscillator signal (LO2) to provide a second output signal ($S_{\text{sub-B}}(t)$) at the second mixer output (B), means for performing a superpositioning of the first output signal ($S_{\text{sub-A}}(t)$) and the second output signal whereby an undesired component of the first output signal is partially or wholly cancelled ($S_{\text{sub-B}}(t)$), the first local oscillator signal (LO1) and the second local oscillator signal (LO2) being square wave signals.

2. (Currently amended) Apparatus (40; 60; 80; 90) as claimed in claim 1, wherein the second mixer (42; 62) applies a negative or a positive coefficient ($1/3$; $-1/3$; $1/n$; $-1/n$) when performing the multiplication of said input signal ($S_{\text{sub-RF}}(t)$) and said second local oscillator signal (LO2).

3. (Currently amended) Apparatus (40; 60; 80; 90) as claimed in claim 1 or 2, wherein the means for performing a superpositioning of the first output signal and the second output signal ($S_{\text{sub.B}}(t)$) are realized as an adder (51; 71).
4. (Currently amended) Apparatus (40; 60; 80; 90) as claimed in claim 1, 2 or 3, wherein the desired band carries an information signal, preferably digital data, modulated on the carrier signal with the carrier frequency ($\omega_{\text{sub.RF}}$).
5. (Currently amended) Apparatus (40; 60; 80; 90) as claimed in one of the preceding claims, wherein the side band frequency ($n \cdot \omega_{\text{sub.LO}}$) is an odd harmonic of the carrier frequency ($\omega_{\text{sub.RF}}$).
6. (Currently amended) Apparatus (40; 60; 80; 90) as claimed in one of the preceding claims claim 1, further comprising a low-pass filter (LPF; 52; 72; 85) at the output side of the apparatus (40; 60; 80; 90).
7. (Currently amended) Apparatus (40; 60; 80; 90) as claimed in one of the preceding claims claim 1, wherein, in order to avoid direct feedthrough, the output of the apparatus (40; 60; 80; 90) is sensed as a differential signal.
8. (Currently amended) Apparatus (40; 60; 80; 90) as claimed in one of the preceding claims claim 1, wherein the period (T1) of the first local oscillator signal (LO1) and the period (T2) of the second local oscillator signal (LO2) have the following relationship: $T2 = T1/3$.
9. (Currently amended) Apparatus (40; 60; 80; 90) as claimed in one of the preceding claims claim 1, wherein the first local oscillator signal (LO1) and the second local oscillator signal (LO2) have zero phase at $t=0$.
10. (Currently amended) Apparatus (60; 80; 90) as claimed in one of the claims 1 through

8, wherein the first local oscillator signal (L_{O1}) and the second local oscillator signal (L_{O2}) have quadrature phases.

11. (Currently amended) Apparatus (~~40; 60; 80; 90~~) as claimed in ~~one of the preceding claims~~claim 1, wherein the square waves have a 50% duty cycle.

12. (Currently amended) Method of processing an input signal ($S_{\text{sub-RF}}(t)$) having a carrier frequency (~~$\omega_{\text{sub-RF}}$~~) defining a desired band and at least one sideband frequency (~~$n \cdot \omega_{\text{sub-LO}}$~~) defining a sideband, where the sideband frequency (~~$n \cdot \omega_{\text{sub-LO}}$~~) is higher than the carrier frequency (~~$\omega_{\text{sub-RF}}$~~), the method comprising the steps of: receiving said input signal ($S_{\text{sub-RF}}(t)$), providing a first local oscillator signal (L_{O1}) having a frequency (~~$\omega_{\text{sub-LO}}$~~) close to or equal to the carrier frequency (~~$\omega_{\text{sub-RF}}$~~), performing a multiplication of said input signal ($S_{\text{sub-RF}}(t)$) with said first local oscillator signal (L_{O1}) in order to provide a first output signal ($S_{\text{sub-A}}(t)$), providing a second local oscillator signal (L_{O2}) with the sideband frequency (~~$n \cdot \omega_{\text{sub-LO}}$~~) performing a multiplication of said input signal ($S_{\text{sub-RF}}(t)$) and said second local oscillator signal (L_{O2}) in order to provide a second output signal ($S_{\text{sub-B}}(t)$), performing a superpositioning of the first output signal ($S_{\text{sub-A}}(t)$) and the second output signal whereby an undesired component of the first output signal is partially or wholly cancelled ($S_{\text{sub-B}}(t)$), wherein the first local oscillator signal (L_{O1}) and the second local oscillator signal (L_{O2}) are square-wave signals.

13. (Currently amended) Method as claimed in claim 12, wherein a negative or a positive coefficient (~~$1/3; -1/3; 1/n; -1/n$~~) is applied when performing the multiplication of said input signal ($S_{\text{sub-RF}}(t)$) and said second local oscillator signal (L_{O2}).

14. (Currently amended) Method as claimed in claim 12 ~~or 13~~, wherein the superpositioning is performed by means of an adder (~~51; 71~~).

15. (Currently amended) Method as claimed in claim 12, ~~13 or 14~~, wherein the desired band carries an information signal, preferably digital data, modulated on the carrier signal

with the carrier frequency (~~$\omega_{\text{sub-RF}}$~~).

16. (Currently amended) Method as claimed in ~~one of the claims 12 through 15~~ claim 12, wherein the sideband frequency (~~$n\omega_{\text{sub-LO}}$~~) is an odd harmonic of the carrier frequency (~~$\omega_{\text{sub-RF}}$~~).

17. (Currently amended) Method as claimed in ~~one of the claims 12 through 16~~ claim 12, using a low-pass filter (~~LPF; 52; 72; 85~~) at the output side.

18. (Currently amended) Method as claimed in ~~one of the claims 12 through 17~~ claim 12, wherein the output is sensed as a differential signal.

19. (Currently amended) Method of ~~one of the claims 12 through 18~~ claim 12, wherein the period (T1) of the first local oscillator signal (~~L01~~) and the period (T2) of the second local oscillator signal (~~L02~~) have the following relationship: $T2 = T1/3$.

20. (Currently amended) Method as claimed in ~~one of the claims 12 through 19~~ claim 12, wherein the first local oscillator signal (~~L01~~) and the second local oscillator signal (~~L02~~) have zero phase at $t=0$.

21. (Currently amended) Method as claimed in ~~one of the claims 12 through 19~~ claim 12, wherein the first local oscillator signal (~~L01~~) and the second local oscillator signal (~~L02~~) have quadrature phases.

22. (Currently amended) Method as claimed in ~~one of the claims 12 through 21~~ claim 12, wherein the square waves have a 50% duty cycle.

23. (Currently amended) Receiver, preferably a heterodyne radio frequency receiver, comprising an apparatus (~~40; 60; 80; 90~~) according to ~~one of the claims 1 through 11~~, said apparatus (~~40; 60; 80; 90~~) being part of a chain of circuits (~~82; 83; 85; 89~~) that processes the input signal (~~$S_{\text{sub-RF}}(t)$~~) to convert it to a low-frequency intermediate-

frequency signal $(S_{\text{sub-IF}}(t))$.

24. (Currently amended) Receiver as claimed in claim 23, being part of a Global System for Mobile communication (GSM) system, a Blue tooth system, or a Universal Mobile Telephony System.